11-16-00

FORM PTO-1390 (REV 11-98) — U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: 2529-000047

US APPLICATION NO (If known see 37 CFR 1 5): 09/700604

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/KR99/00246	17 May 1999 (17.05.99)	16 May 1998 (16.05.98)

TITLE OF INVENTION: MAGNETIC CIRCUIT FOR ROTATING APPARATUS

APPLICANT(S) FOR DO/EO/US: Enertec Korea Co., Ltd. et al.

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [X] This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. [ ] This is a **SECOND or SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. [X] This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(l).
4. [X] A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. [X] A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. [X] is transmitted herewith (required only if not transmitted by the International Bureau).
   b. [X] has been transmitted by the International Bureau.
   c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US).
6. [ ] A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. [X] Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. [ ] are transmitted herewith (required only if not transmitted by the International Bureau).
   b. [ ] have been transmitted by the International Bureau.
   c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.
   d. [X] have not been made and will not be made.
8. [ ] A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. [X] An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. [ ] A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern document(s) or information included:

11. [ ] An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. [X] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. [ ] A FIRST preliminary amendment.
    [ ] A SECOND or SUBSEQUENT preliminary amendment.
14. [ ] A substitute specification.
15. [ ] A change of power of attorney and/or address letter.
16. [X] Other items or information:
    1) copy of International Application PCT/KR99/00246
    2) copy of International Search Report
    3) Certificate of Express Mailing
    4) return postcard

529 Rec'd PCT/PTO 15 NOV 2000

U.S. APPLICATION NO (if known see 37 CFR 1.5) 09/700604 | INTERNATIONAL APPLICATION NO PCT/KR99/00246 | ATTORNEY'S DOCKET NUMBER 2529-000047

17. [X] The following fees are submitted:	CALCULATIONS PTO USE ONLY	
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5))		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO **$970.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO **$840.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO **$760.00**		
International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(l)-(4) **$670.00**		
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) **$96.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$970.00	
Surcharge of **$130.00** for furnishing the oath or declaration later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(c)).	$ -0-	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	6 -20 =	0	X $18.00	$ -0-	
Independent claims	3 -3 =	0	X $78.00	$ -0-	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+$260.00	$ -0-	
TOTAL OF ABOVE CALCULATIONS =				$ 970.00	
Reduction of 1/2 for filing by small entity, if applicable. A Small Entity Statement must also by filed (Note 37 CFR 1.9, 1.27, 1.28).				$ -0-	
SUBTOTAL =				$ 970.00	
Processing fee of **$130.00** for furnishing the English translation later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +				$ -0-	
TOTAL NATIONAL FEE =				$970.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +				$ 40.00	
TOTAL FEES ENCLOSED =				$1,010.00	
				Amount to be: refunded	$
				charged	$

a. [ ] A check in the amount of $_____ to cover the above fees is enclosed.

b. [X] Please charge my Deposit Account No. 08-0750 m the amount of $1,010.00 to cover the above fees. A duplicate copy of this sheet is enclosed.

c. [X] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 08-0750 A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO

G. Gregory Schivley
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P.O. Box 828
Bloomfield Hills, MI 48303

SIGNATURE

G. Gregory Schivley
NAME

27,382
REGISTRATION NUMBER

MAGNETIC CIRCUIT FOR ROTATING APPARATUS

BACKGROUND

1. Field of the invention

The present invention relates to a magnetic circuit for energy conversion having a structure that magnets and magnet pole pieces(or planes) of an armature are disposed in parallel with respect to the shaft of an electric motor in order for a flux of a magnetic field to form a magnetic circuit in parallel with the shaft, to thereby obtain a dynamic force or a rectangular wave electromotive force.

2. Description of the Prior Art

A rotating apparatus and a power system, which are used so far, is structured vertically(at the right angle) when magnet 5 and magnet pole pieces(or planes) of an armature are traversely disposed (hereinafter, referred to as -with respect to a shaft-), so that a vertical type magnetic circuit is constructed which a flux of a magnetic field is circulated in directions of york 7, armature 6, magnet 5, armature 6, and magnet 5.

FIG. 1A is a schematic view of a conventional vertical type electric motor which has a magnetic flux in a vertical direction with respect to the motor shaft, FIG. 1B is a view for showing a flow of a magnetic field in the electric motor of FIG. 1A

As shown in FIG. 1A, the conventional electric motor includes an annular stator 1 and a rotor 2 rotating in the annular stator 1. The annular stator 1 is

constituted with an armature 6 and a york 7, and the rotor 2 has a shaft 3 and magnet 5.

FIG.1B shows a different structure from FIG. 1A. That is, magnet 15 is formed on outside and an armature 16 is formed on inside to be rotated together with an armature 16.

Since magnetic circuits in FIGs. 1A and 1B, as shown in FIG. 1B, forms a flow of a magnetic flux vertically(at the right angle) with respect to the shaft when rotating, the magnetic circuits produces a rectangular wave in electromotive force signal system or generates a torque by means of a rectangular wave control input.

Further, as shown in FIG. 1A, in order for the magnet pole pieces of magnet 5 be formed in the vertical direction with respect to the shaft to be rotated, mechanical vibration of applied attraction and repulsion forces by means of the flow of a magnetic field is applied in the cross-sectional direction, to thereby apply much stress on the shaft.

Particulary, this phenomenon at a high speed increases load to the shaft. In order to solve the problem, strenuous exertion has been invested for the development of high strength material of excellent tensile toughness and for high precision machining technology so as to inevitably increase the production cost.

Further, the magnetic circuit in the conventional vertical circuit type electrical motor has another cost increase factor with respect to the maintenance fee and production cost because of a magnetic loss by a magnetic resistance according to multilevel flows of a magnetic field, an energy loss by iron core loss, etc., according to unnecessary material, and material loss by unnecessary magnetic circuit structures.

FIG. 2A is a view for showing a conventional three-phase full-wave rectifier circuit, FIG. 2B is a view for showing a voltage wave by a conventional three-phase generator, and FIG. 3C is a view for showing a rectified wave of a voltage wave generated by a conventional three-phase generator through the rectifier circuit of FIG. 2A.

As shown in FIG. 2A to FIG. 2C, rectification from an alternate current(AC) wave to a direct current(DC) wave(actually, a pulsating wave) requires a complex circuit including an Y-connection and diodes D1, D2, D3, D4, D5, and D6. Further, high precision filters are required in order to obtain an nearly complete direct current wave.

However, in actual, since it is difficult to obtain a complete DC current in a high voltage, the cost is increased in a system requiring a nearly complete high DC voltage with energy loss by various constituents used for obtaining a high and pure DC voltage.

SUMMARY OF THE INVENTION

In order to solve the above problems, it is a first object to provide a magnetic circuit for a rotating apparatus having magnet pole pieces(planes) of a magnetic rotor or a static armature (structures such as magnetic stator and rotating armature are included) disposed in parallel with a shaft(when the shaft is traversely disposed) as a magnetic circuit for a magnetic flux of magnet side to be circulated in the traverse(parallel) direction, to thereby obtain a high torque rotation force by a highly efficient rectangular electromotive force according to a mechanical rotation force and by a rectangular wave control electric power according to an electric

energy.

It is a second object to provide a magnetic circuit for a rotating apparatus having a propeller mounted on a supporter connecting a shaft and a rotor with pole pieces disposed in parallel with respect to the shaft, to thereby obtain a propulsion force by using an air convection phenomenon appearing upon the rotation of the propeller or a rectangular wave electromotive force by -wind force- which is a mechanical propulsion force.

It is a third object to provide a magnetic circuit for a rotating apparatus having a wave washer between the shaft and bearings so that mechanical vibrations appearing in parallel with the shaft are absorbed and the mechanical vibrantions apprearing by the operation of attraction and repulsion forces applied perpendicularly to the shaft are minimal compared to other device, thereby obtaining a high speed rotation force.

It is a fourth object to provide a magnetic circuit for a rotating apparatus having a matrix-structured magnetic circuit providing a twist angle to magnets and rotors so that a spiral flow of a magnetic field flux is derived to reduce a reaction force of an armature occurring upon generation of an electromotive force and a high speed rotating force is obtained upon generation of a mechanical dynamic force.

It is a fifth object to provide a magnetic circuit for a rotating apparatus having a compound structure of multilayers of magnets and armatures on the same shaft wherein one layer is used as an exciter and another layer is used as a rotor or a synchronous machine.

It is a sixth object to provide a magnetic circuit for a rotating apparatus with a

flow of a magnetic field circulated traversely (in parallel) in directions of magnet, armature and magnet with respect to the shaft, thus capable of reducing material loss by eliminating a york which connects armatures or magnets.

It is a seventh object to provide a magnetic circuit for a rotating apparatus having a magnetic resistance of a slit between armatures(phases) and magnets in order for a flux of a magnetic field not to be circulated between the armatures and magnets, so that a magnetic field flux in magnets is guided to be magnetically circulated along an armature to a neighboring magnets, to thereby obtain a rectangular wave of an electromotive force occurring according to interlinkage of magnetic field flux circulated in coils of an armature.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects of the present invention will become readily apparent by reference to the following detailed description when considered in conjunction with the accompanying drawings wherein:

FIG. 1A is a schematic view of a conventional vertical type electric motor and synchronous machine which has a magnetic flux in a vertical direction with respect to the motor shaft;

FIG. 1B is a view for showing a flow of a magnetic field in the electric motor of FIG. 1A;

FIG. 2A is a view for showing a conventional 3-phase full wave rectifying circuit;

FIG. 2B is a view for showing a voltage waveform by a conventional 3-phase generator;

FIG. 2C shows a full-wave rectified waveform of a voltage waveform of a conventional 3-phase generator;

FIG. 3 is a schematic perspective view of a 4-pole 3-phase generator according to one embodiment of the present invention;

FIG. 4A shows a waveform of a magnetic field of 4-pole 3-phase generator according to one embodiment of the present invention;

FIGs. 4B, 4C, 4D, and 4E show electromotive force waveforms of a 3-phase generator according to one embodiment of the present invention;

FIGs. 5A and 5B are load state views of a generator according to one embodiment of the present invention;

FIG. 6 is a view for showing a magnetic flow of a single phase motor according to another embodiment of the present invention; and

FIG. 7 is an explanatory view of operations of a single phase motor according to another embodiment of the present invention.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

According to one embodiment of the present invention, a magnetic circuit for a rotating apparatus which is employed for a rectangular wave generator or a rectangular wave electric motor includes a rotating shaft, a plurality of supporters fixedly mounted perpendicularly to the rotating shaft, a plurality of rotors each mounted to each end of the plurality of supporters in order for pole pieces(faces) to be parallel with the rotating shaft so that the rotors are rotated by an attraction force and a repulsion force of a magnetic field, and a plurality of stators (armatures) mounted in a certain interval to each other and each having a coil on

their body to obtain alternate magnetic field flux from the pole pieces(faces) of the rotors (magnets) occurring upon rotation of the rotors.

Further, according to a preferred characteristic of the present invention, a rectangular wave electric power generator, a annular magnetic field flux deriver, and a mechanical dynamic power generator, a phase angle detector, and a position detector are included. The rectangular wave electric power generator has C-type, U-type, and I-type or twist-structured C-type, U-type, and I-type armatures for derivation of an alternate magnetic field flux (or magnetic flux) of a magnet generated upon rotation. A york that is a magnetically circulating medium between armatures and magnets is eliminated to generate a rectangular wave electromotive force and a rectangular wave signal according to discontinuous flow of magnetic field flux by a magnetic resistance.

According to a preferred characteristic of the present invention, the annular magnetic field flux deriver has an armature and magnet. The bodies of the armature and magnet have skew-structured twist angles so that a flow of a magnetic flux upon rotation is formed annually.

The mechanical dynamic power generator has a plurality of armatures and a plurality of magnets so that rotors are rotated by a rectangular wave alternate magnetic flux generated by electric energy. The rotors are disposed in raw with respect to the shaft so that parallel driving is enabled according to a required torque quantity.

The phase angle detector and the position detector obtain phase angles and position information according to a quantity change of a rectangular wave electromotive force by means of a different winding number of coil mounted on an

armature at a necessary position.

As another preferred characteristic of the present invention, a magnetic circuit of complex functions for a rotating apparatus. The magnetic circuit has the multilayer of magnets and armatures on one shaft, some layers are used for rotors, some are used for synchronous machines or rectangular wave generators, and the other are used for exciters which excites magnet.

According to another preferred characteristic of the present invention, a magnetic circuit for a rotating apparatus having a DC electric power generator is further provided. In the DC electric power generator, rectangular wave electric powers from a plurality of armatures are connected in a single phase-type manner to produce a DC electric power.

As shown in FIG. 3, rotors 27 are fixed to supporters 29, and pole pieces of the rotors 27 are mounted in parallel with respect to the shaft 23. Further, coils 28 is mounted on the stators 26 to be opposite to pole pieces(faces) with respect to the shaft 23.

In the embodiment of the present invention, a 4-pole 3-phase rotor is, for possible convenience, shown for description of a rotating operation.

Accordingly, stators 26 are disposed in interval of 60 degree, so there are six stators 26. Even though there is not shown here, these stators 26 are fixed by the housing. Rotors 27 are disposed in interval of 90 degree and mounted on one ends of supporters 29 fixed to the shaft 23. The polarity of one rotor has an opposite polarity or the same polarity (not shown) to the neighboring rotor as shown in FIG. 3.

The number and polarity of the stators 26 and rotors 27 may be changed.

Further, a propeller(not shown) may be mounted on a supporter which connects the shaft 23 and the rotor 27 or between the shaft 23 and the rotor 27, so that propulsion force is obtained from air convection phenomenon generated by the rotation of the rotors 27.

In the rectangular wave generator(not shown) according to the embodiment of the present invention, as the shaft 23 is rotated by an external dynamic power, a magnetic rotor generates triangle wave magnetic flux. The triangle wave magnetic flux is induced to an armature to generate a rectangular waves as shown in FIGs. 4B, 4C, and 4D to winding coils. The triangle waves are generated by a matrix-structured magnetic circuit and current controls of the field in the apparatus according to the embodiment of the present invention.

FIG. 4E is a view for showing a conversion to a DC electric power by composite waves of FIGs. 4B, 4C, and -4D.

Further, sinusoidal waves are made by a phase interval and field structure.

FIGs. 5A and 5B are views for showing a load state of a generator according to an embodiment of the present invention.

As shown in FIG. 5A, when described with 4-pole 3-phase, as given from a magnet (A) to a magnet (D), armatures 52-1 and 52-2 of one body in a twisted structure does not show any polarity as any load is not applied, but show an induced opposite polarity to a magnetic flux as load is applied, according to the Lenz law.

However, according to the embodiment of the present invention, as the above magnet state, that is, as given from the magnet (A) to the magnet (D), is rotated in an arrow direction denoted above the magnet (A) by an external dynamic

force and the magnet (A) escapes from magnet pole pieces(face) 52-1 and 52-3, a magnet polarity S1 is induced in the magnet pole piece(face) 52-1 of the armature and a magnet polarity N1 is induced in the magnet pole piece(face) 52-2 of the armature of a twist structure. Therefore, the rotation of the magnet (A) is interrupted and the rotation of the magnet (B) is promoted in the rotation direction.

By such operation, the action and reaction of an armature occur together, which is a characteristic factor of the present invention that can not be obtained in the conventional generator.

At this time, the magnets are arranged at the right angle or at a different angle if necessary.

In FIG. 5B, the magnets are arranged in the same polarity and armatures are arranged side by side with respect to the magnets. As rotated in the arrow direction denoted over the magnet (A) by load of an external dynamic force, a magnetic polarity S1 is induced on the magnet pole piece(face) of an armature 53-1 when the magnet (A) gets out of magnet pole pieces (faces) of armatures 53-1 and 53-3, and the magnet pole piece (faces) of armature 53-3 of the body by the same arrangement structure is induced to a magnetic polarity N1, so that the magnet (A) is drawn back for the rotation to be interrupted and the magnet (B) is also interrupted in its progress by the magnet pole pieces(faces) of other armatures 53-2 and 53-4. However, the purpose of the magnetic circuit of FIG. 5B is for obtaining an on-off signal so that much energy is not consumed.

FIG. 6 is a view for explaining a flow of a magnetic field when operated as an electric motor by applying current to a coil of a stator in a single phase motor having six rotors in interval of 60 degree in a digital generator of FIG. 3, and FIG. 7

is a view for explaining operations of FIG. 6.

Accordingly, a spiral flow of a magnetic field is shown with a structure having a supporter and a rotor further mounted in interval of 60 degree from the structure of FIG. 3.

Stators with coils wound and a rotors 63 are shown in FIG. 6, and, in FIG. 7, magnet pole pieces(faces) of stators 71-1 and 71-2 as an integral stator 71 has a skew angle to induce a spiral flux of a magnetic field, so that a rotating force of a rotor 73 is smoothly generated.

That is, a magnetic flux of a rotating magnet 63 passes through a slit to be induced on a magnet pole piece 61A of a static armature, and the induced magnetic flux 65 moves along another static armature 68 up to another rotating magnet 67. With this operation repeated, a rotating force by a spiral flux of a magnetic field is generated.

The apparatus according to the present invention has the following effects through some embodiments.

That is, as applied to a generator, since an electromotive force wave is a rectangular wave, a DC conversion characteristic is excellent, material loss is small since only necessary material is machined with less redundancy of a magnetic circuit. The minimization of the material loss brings the minimization of iron core loss and magnetic resistance to reduce energy loss.

Further, since the action and reaction is simultaneously applied when loaded, the minimization of a mechanical energy is achieved and a conversion loss from AC to DC can be minimized.

In the meantime, as applied to an electric motor, since the rotation

movement is that attraction force and repulsion force is applied in parallel with respect to the shaft, it is easy to absorb a vibration wave by a mechanical vibration so that a high speed rotation can be obtain, and since a skew space arrangement and a twist angle are easily obtained, calking torque can be reduced greatly.

CLAIMS

What is claimed is:

1. A magnetic circuit for a rotating apparatus having a parallel structure or a skew structure of magnet pole pieces of magnets or armatures with respect to a shaft, comprising:

a rotating shaft;

a plurality of supporters fixedly mounted in a perpendicular direction to the circumference of the rotating shaft;

a plurality of rotors rotated by attraction force and repulsion force of a magnetic field, a magnet pole piece being arranged in parallel with respect to the shaft on each end of the plurality of supporters; and

a plurality of armatures (stators) having a coil wound on the body thereof, the coil being mounted at an interval ouside the rotors and receiving induced alternate magnetic flux of the rotors, the alternate magnetic flux generated when rotated, and magnet pole pieces being arranged in parallel or in skew with the rotating shaft.

2. The magnetic circuit for a rotating apparatus as claimed in claim 1, wherein the rotors have the parallel structure or the skew structure of the magnet pole pieces of the magnets with respect to the shaft so as to be rotated by a force of a magnetic field in a parallel direction with the rotating shaft.

3. The magnetic circuit for a rotating apparatus as claimed in claim 1, wherein the armatures have the parallel structure or the skew structure of magnet

pole pieces of magnets or armatures with respect to the shaft, and the magnets or armatures are one of C-type, U-type, and I-type.

4. The magnetic circuit for a rotating apparatus as claimed in claim 1, wherein the magnet pole pieces of the magnets or the armatures have a parallel structure or a skew structure with respect to the shaft, and the magnets or the armatures have propellers on a supporter between the shaft and the rotors.

5. The magnetic circuit for a rotating apparatus which comprises, the magnet pole pieces of the magnet or the armatures having the parallel structure or the skew structure with respect to the shaft and the rotors being rotated by a force of a magnetic field formed in the parallel direction with the rotating shaft and thus minimizing the lateral vibration of the shaft under rotation.

6. A magnetic circuit for a rotating apparatus having a parallel structure or a skew structure, the rotating apparatus being a rectangular wave generator or a rectangular wave electric motor, comprising:

rectangular wave electric power generating means for generating a rectangular wave electromotive force and a rectangular wave signal with a discontinuous flow of a magnetic flux by eliminating a york which is a magnetic circulation medium between armatures and magnets;

spiral magnetic flux deriving means constituting a magnetic circuit which generates a spiral flow of a magnetic flux on rotation with the bodies of armatures or magnets having a twist angle of a skew structure;

mechanical dynamic force generating means having a rotation unit constituted with a plurality of armatures and a plurality of magnets in order for a rotor to be rotated by a rectangular wave alternate magnetic flux generated with input of electrical energy, and enabling parallel driving according to a required quantity of torque by constituting a plurality of the rotation units in row with respect to the shaft;

phase detecting means and position detecting means for obtaining a phase angle and position information according to a quantity change of a rectangular wave electromotive force generated by an armature of a different winding at a required position; and

direct current electric power generating means for generating a direct current electric power by collectively connecting rectangular wave electric powers of a plurality of armatures in a single phase manner.

Abstract

An energy conversion magnetic circuit is constituted with magnet pole pieces of magnets or armatures which are in parallel with respect to the shaft to obtain a dynamic force or an electromotive force. The magnetic circuit for a generator or an electric motor has a rotating shaft, a plurality of supporters fixedly mounted in a perpendicular direction to the circumference of the rotating shaft, a plurality of rotors arranged in parallel with respect to the shaft on each end of the plurality of supporters to be rotated by attraction force and repulsion force of a magnetic field, and a plurality of armatures having a coil wound on the body thereof. The coil is mounted at an interval outside the rotors and receives induced alternate magnetic flux of the rotors to generate a rectangular wave electromotive force or to obtain a high torque with input of electrical energy. The alternate magnetic flux generated when rotated, and magnet pole piece are arranged in parallel with the rotating shaft

FIG. 1A

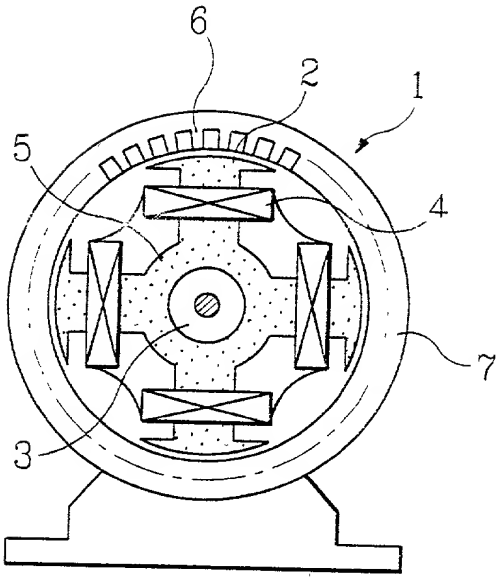


FIG. 1B

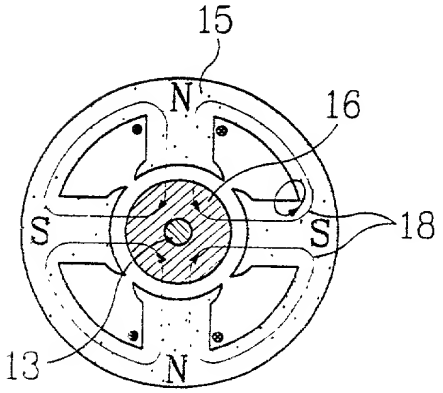


FIG. 2A

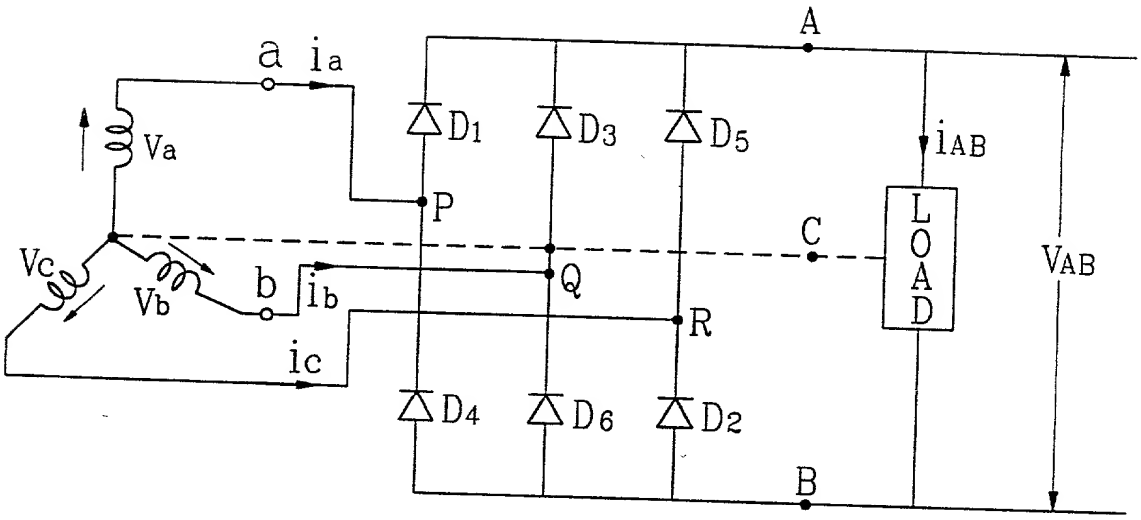


FIG. 2B

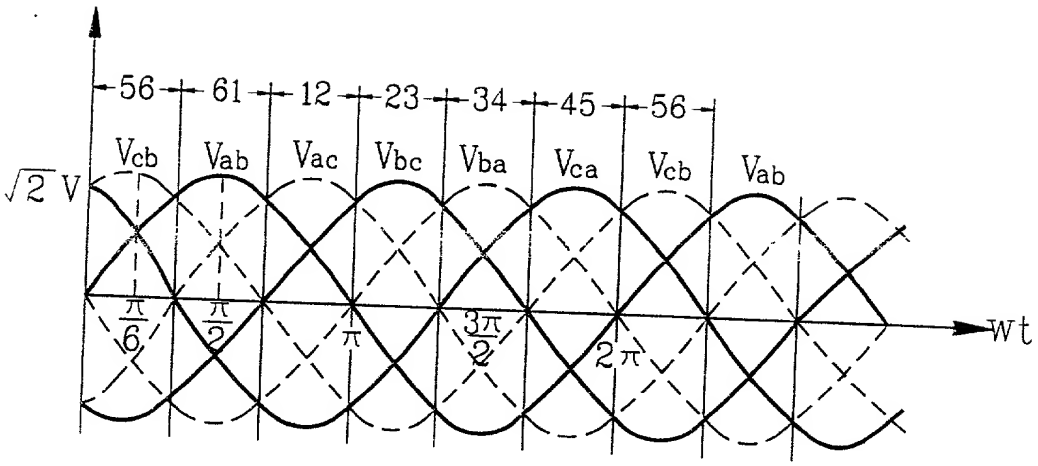
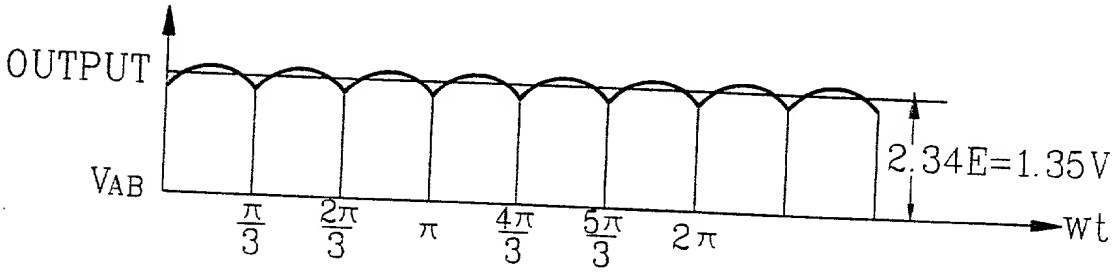

56
61
12
23
34
45
56
Vcb
Vab
Vac
Vbc
Vba
Vca
Vcb
Vab
√2 V
π/6
π/2
π
3π/2
2π
wt

FIG. 2C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π
4π/3
5π/3
2π
wt

FIG. 3

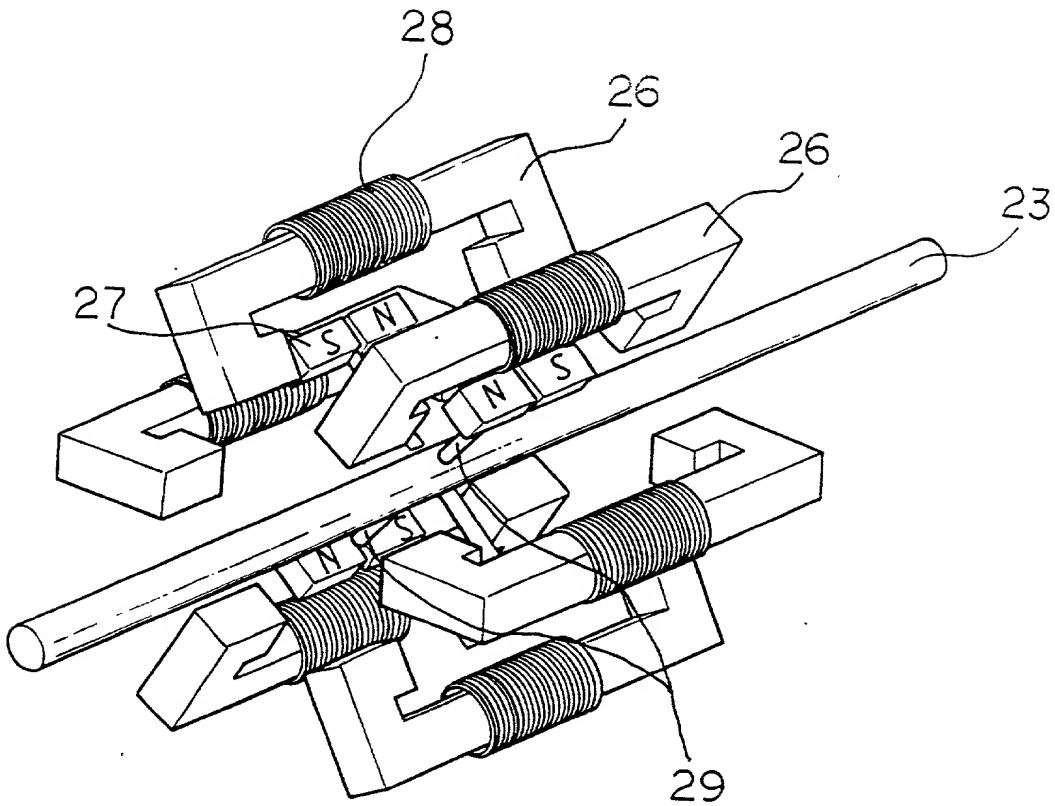


FIG. 4A

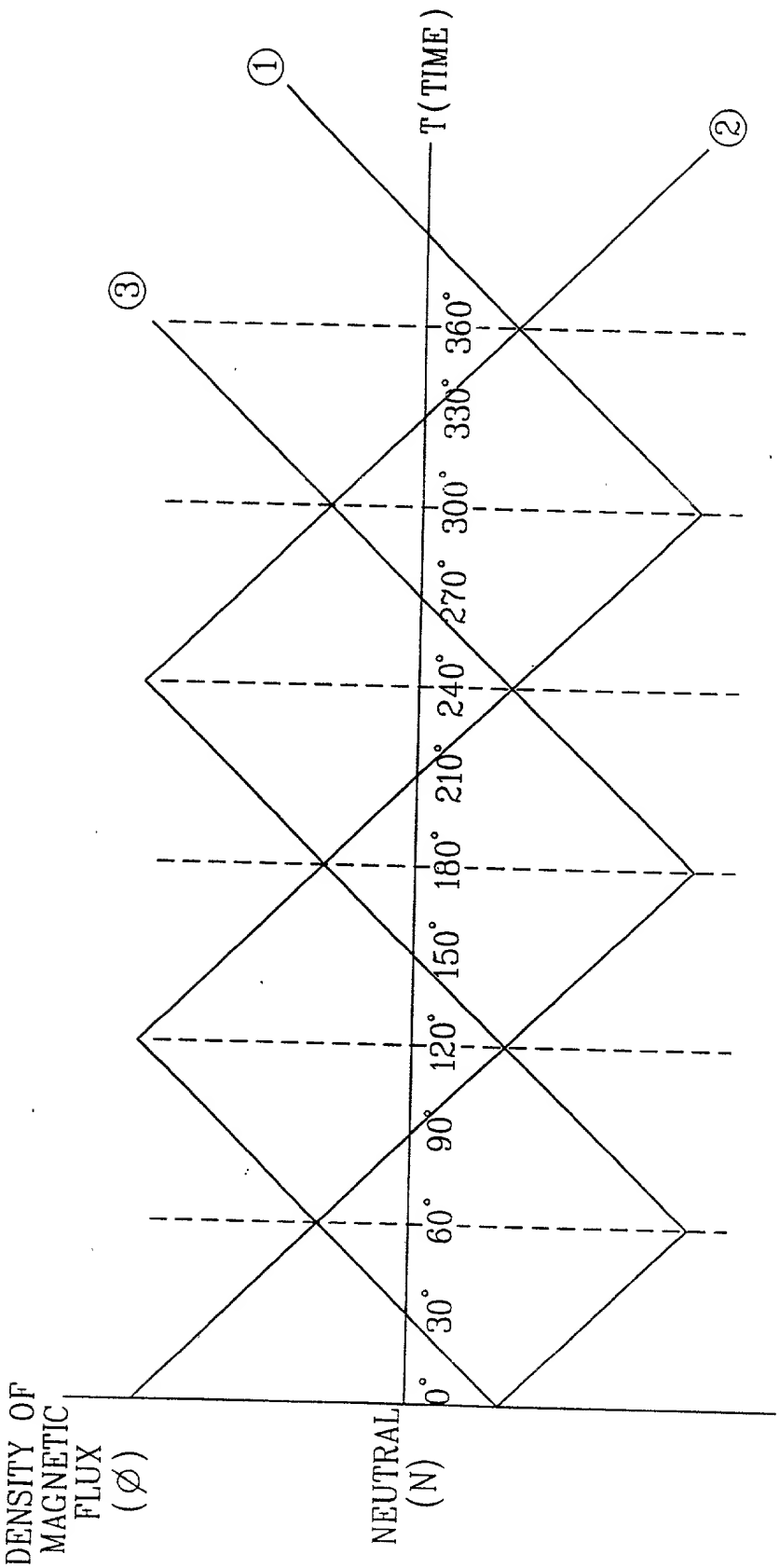

①
②
③
T(TIME)
0°
30°
60°
90°
120°
150°
180°
210°
240°
270°
300°
330°
360°
NEUTRAL (N)
DENSITY OF MAGNETIC FLUX (Ø)

FIG. 4B

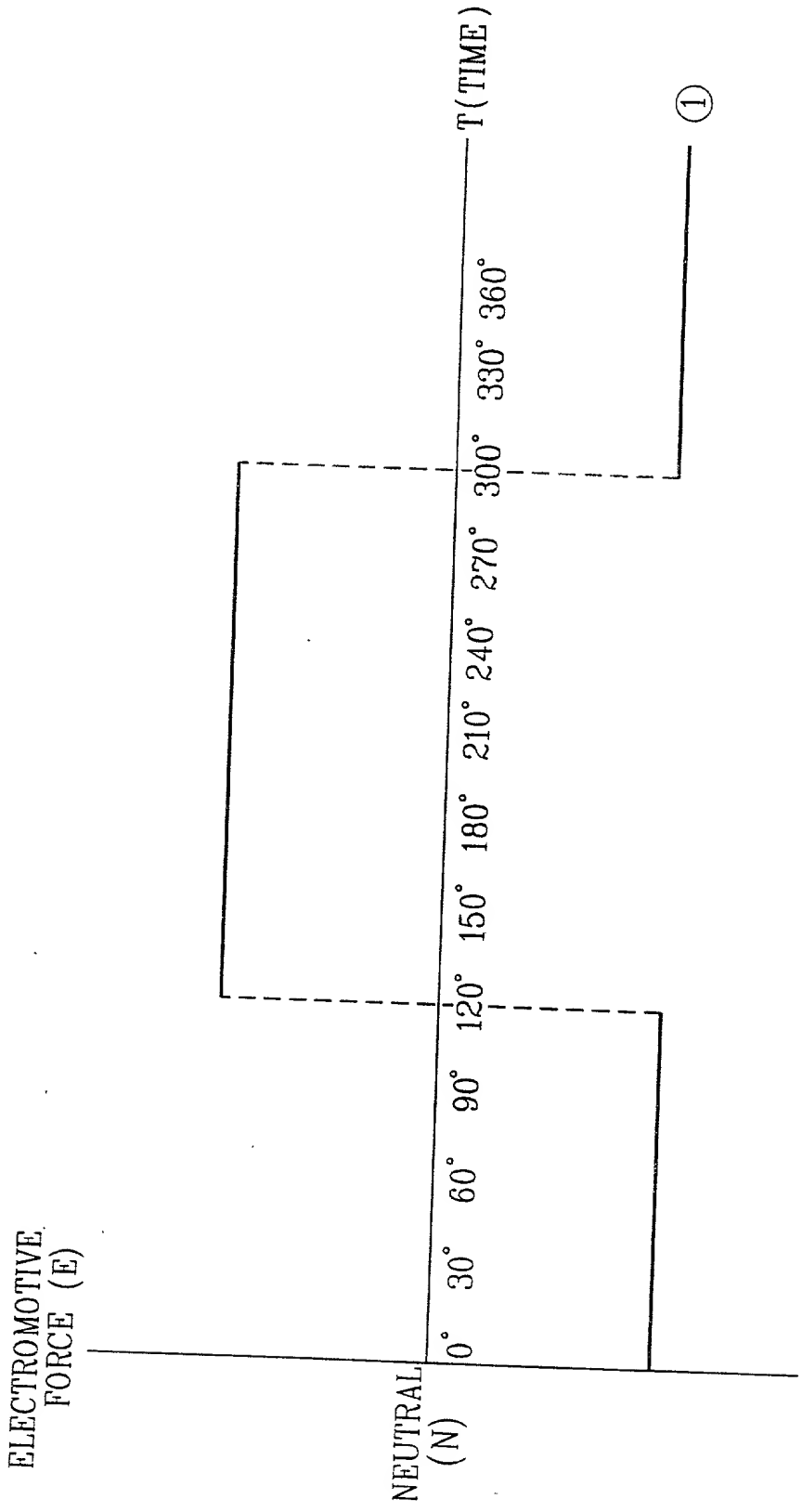

ELECTROMOTIVE FORCE (E)
NEUTRAL (N)
0°
30°
60°
90°
120°
150°
180°
210°
240°
270°
300°
330°
360°
T(TIME)
①

FIG. 4C

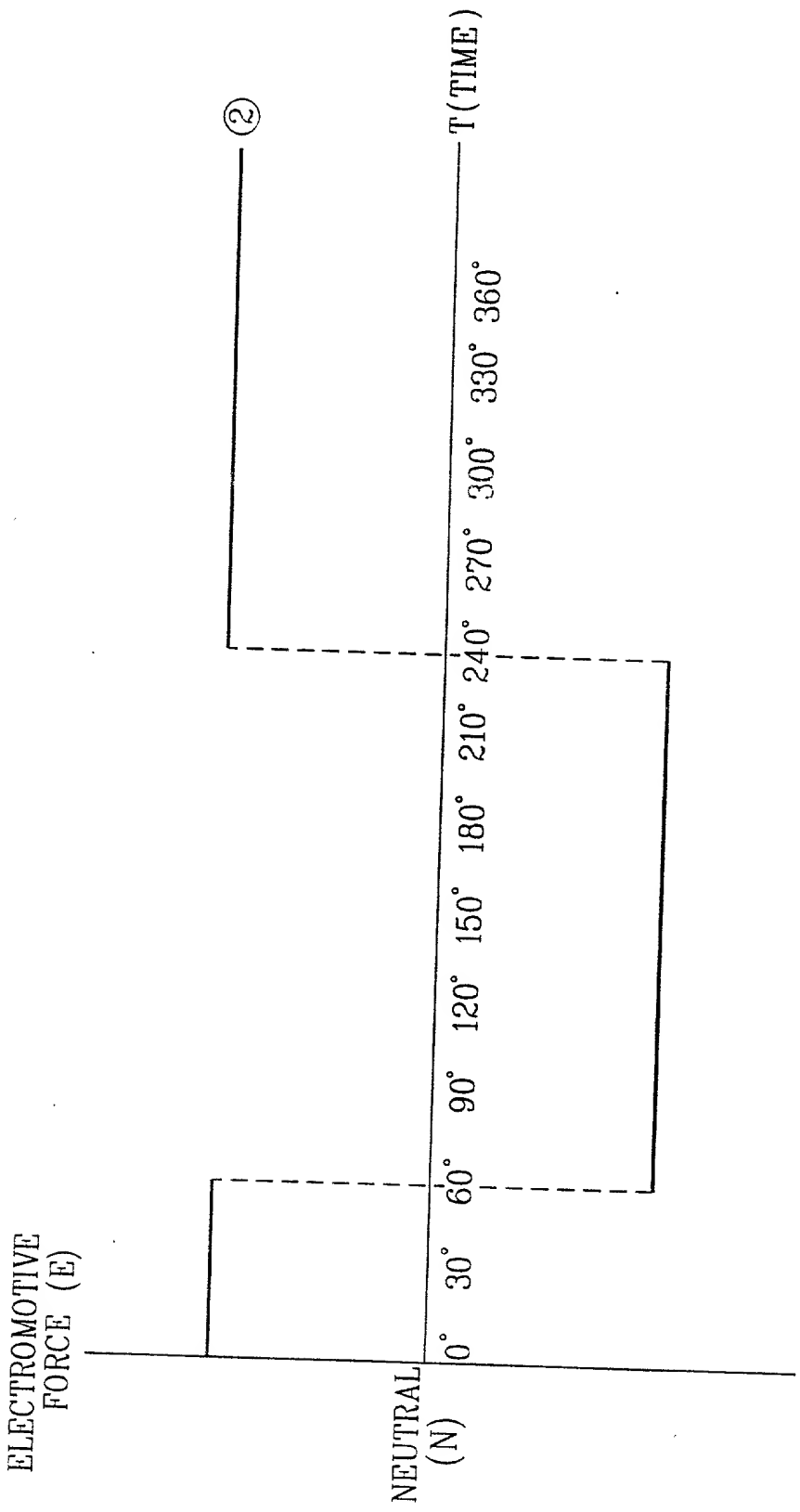

②
T(TIME)
0° 30° 60° 90° 120° 150° 180° 210° 240° 270° 300° 330° 360°
ELECTROMOTIVE FORCE (E)
NEUTRAL (N)

FIG. 4D

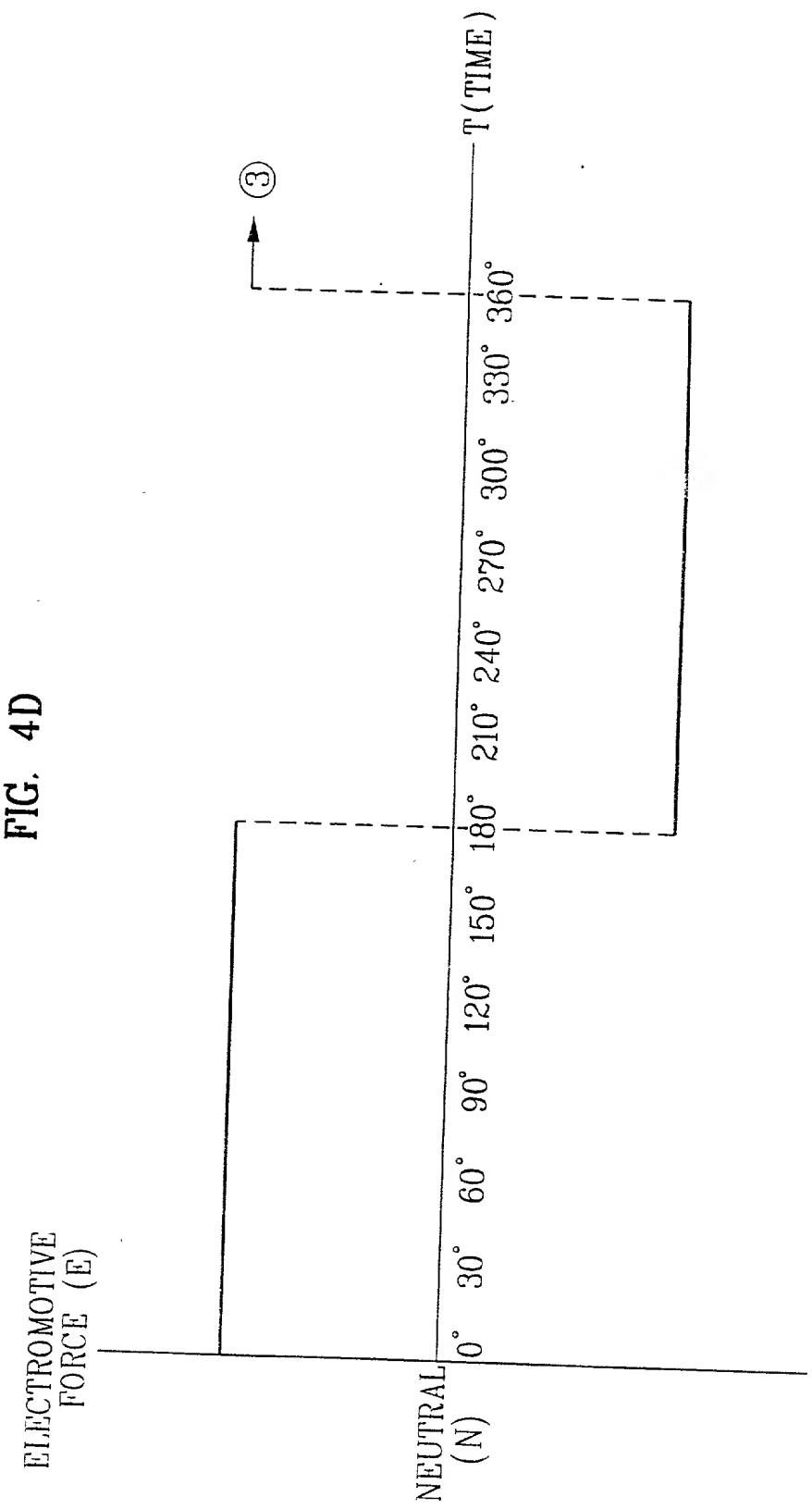

ELECTROMOTIVE FORCE (E)
NEUTRAL (N)
0°
30°
60°
90°
120°
150°
180°
210°
240°
270°
300°
330°
360°
T(TIME)
③

FIG. 4E

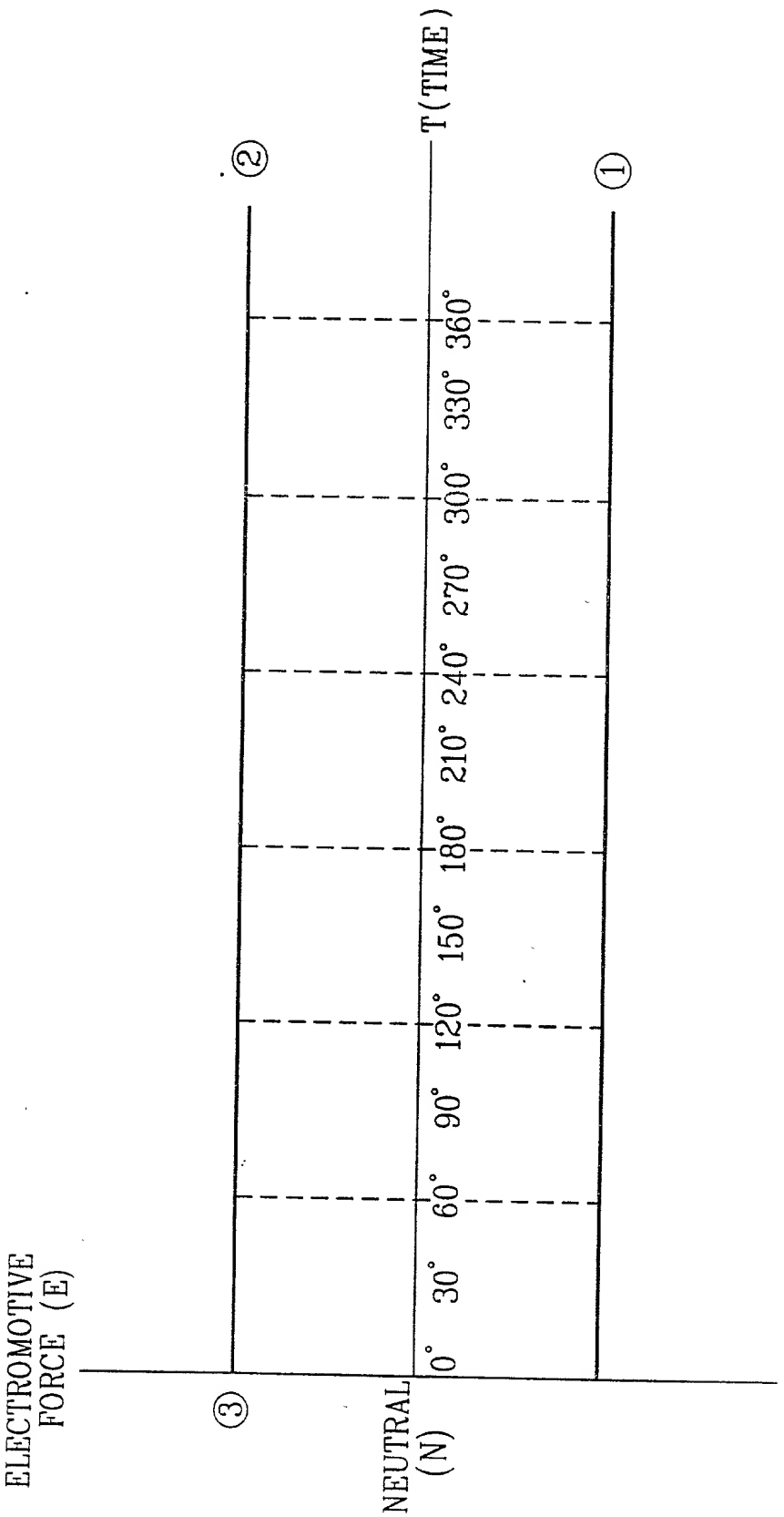

T(TIME)
②
①
③
0°
30°
60°
90°
120°
150°
180°
210°
240°
270°
300°
330°
360°
ELECTROMOTIVE FORCE (E)
NEUTRAL (N)

FIG. 5A

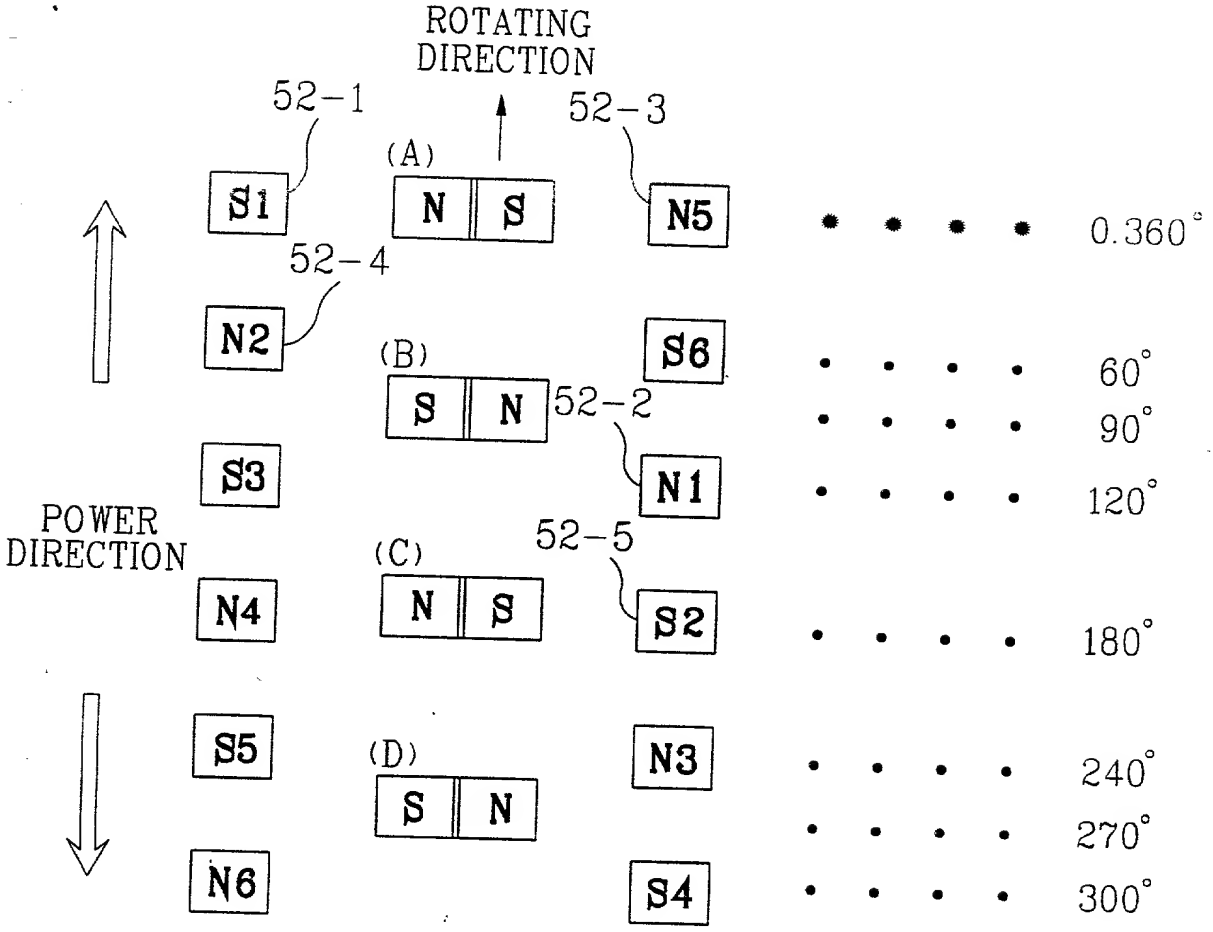

ROTATING DIRECTION
52-1
52-3
(A)
S1
N
S
N5
0.360°
52-4
N2
(B)
S6
60°
S
N
52-2
90°
S3
N1
120°
POWER DIRECTION
52-5
(C)
N4
N
S
S2
180°
S5
(D)
N3
240°
S
N
270°
N6
S4
300°

FIG. 5B

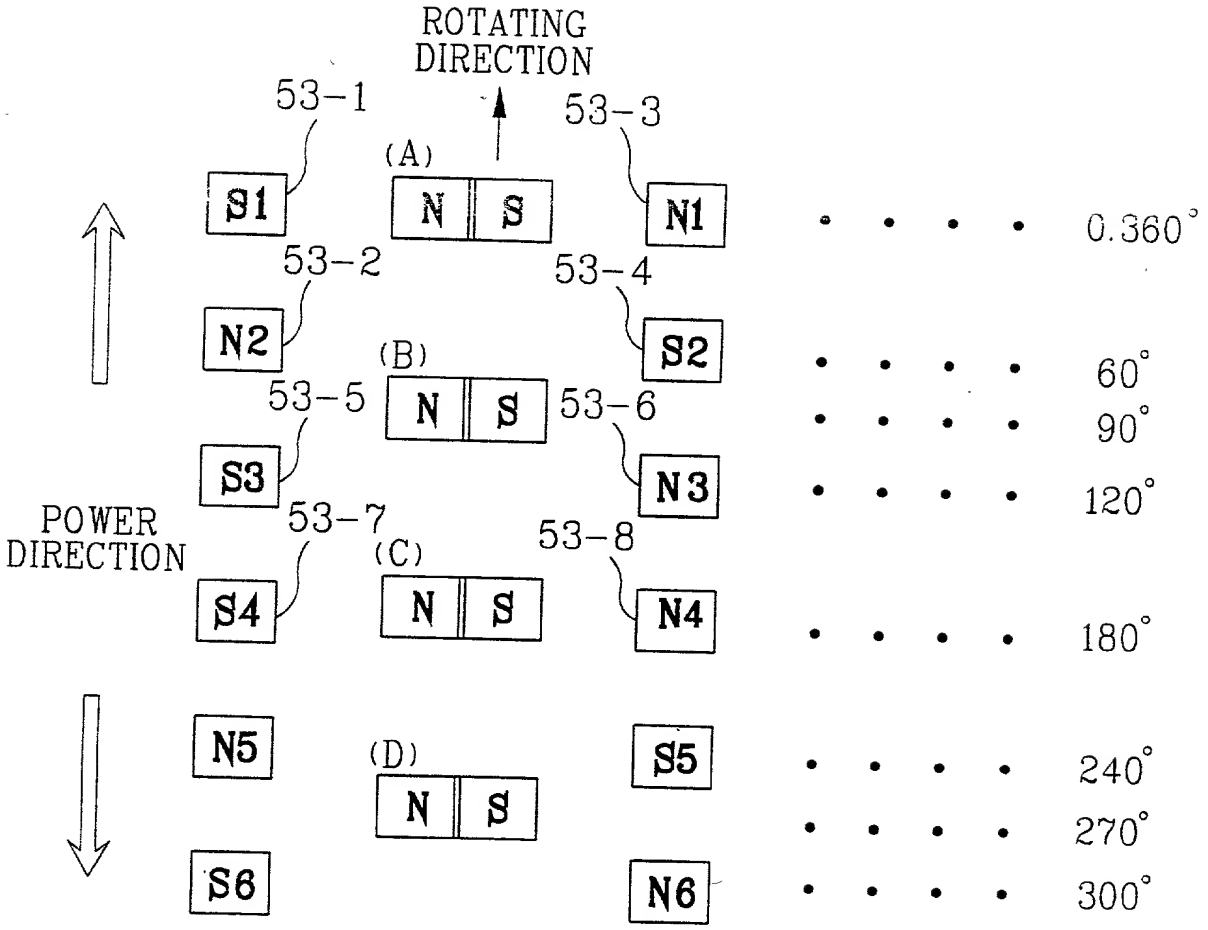

ROTATING DIRECTION
53-1
53-3
(A)
S1
N
S
N1
0.360°
53-2
53-4
N2
S2
(B)
60°
53-5
N
S
53-6
90°
S3
N3
120°
POWER DIRECTION
53-7
53-8
(C)
S4
N
S
N4
180°
N5
S5
(D)
240°
N
S
270°
S6
N6
300°

FIG. 6

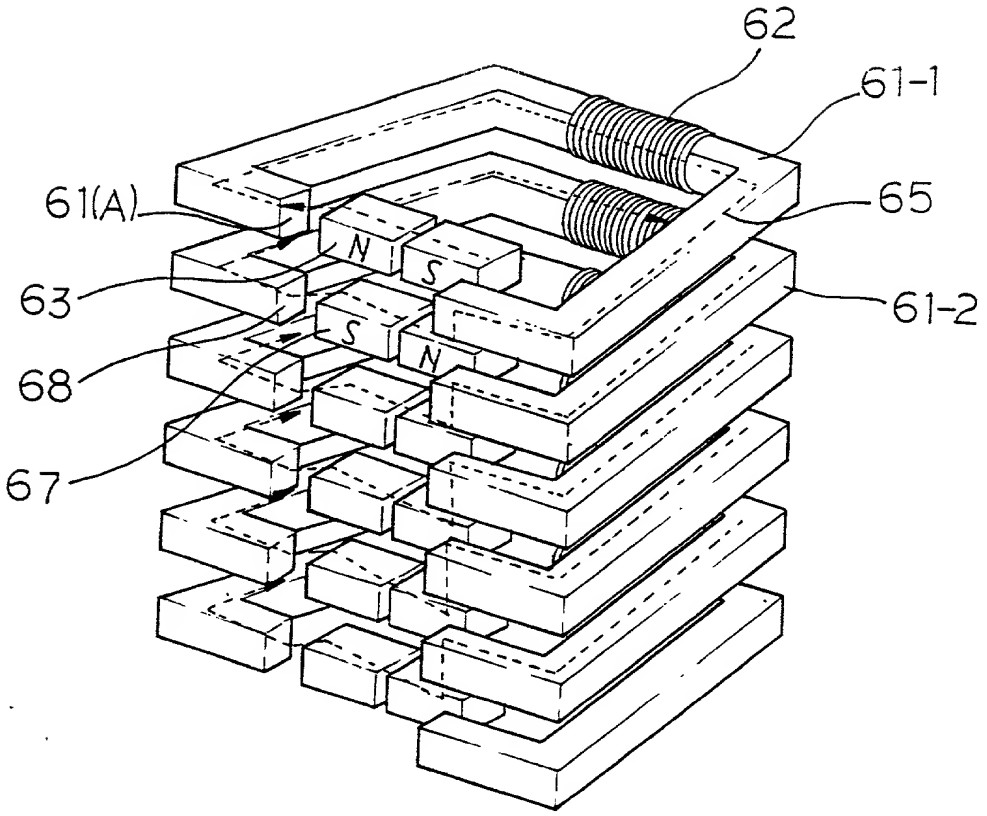
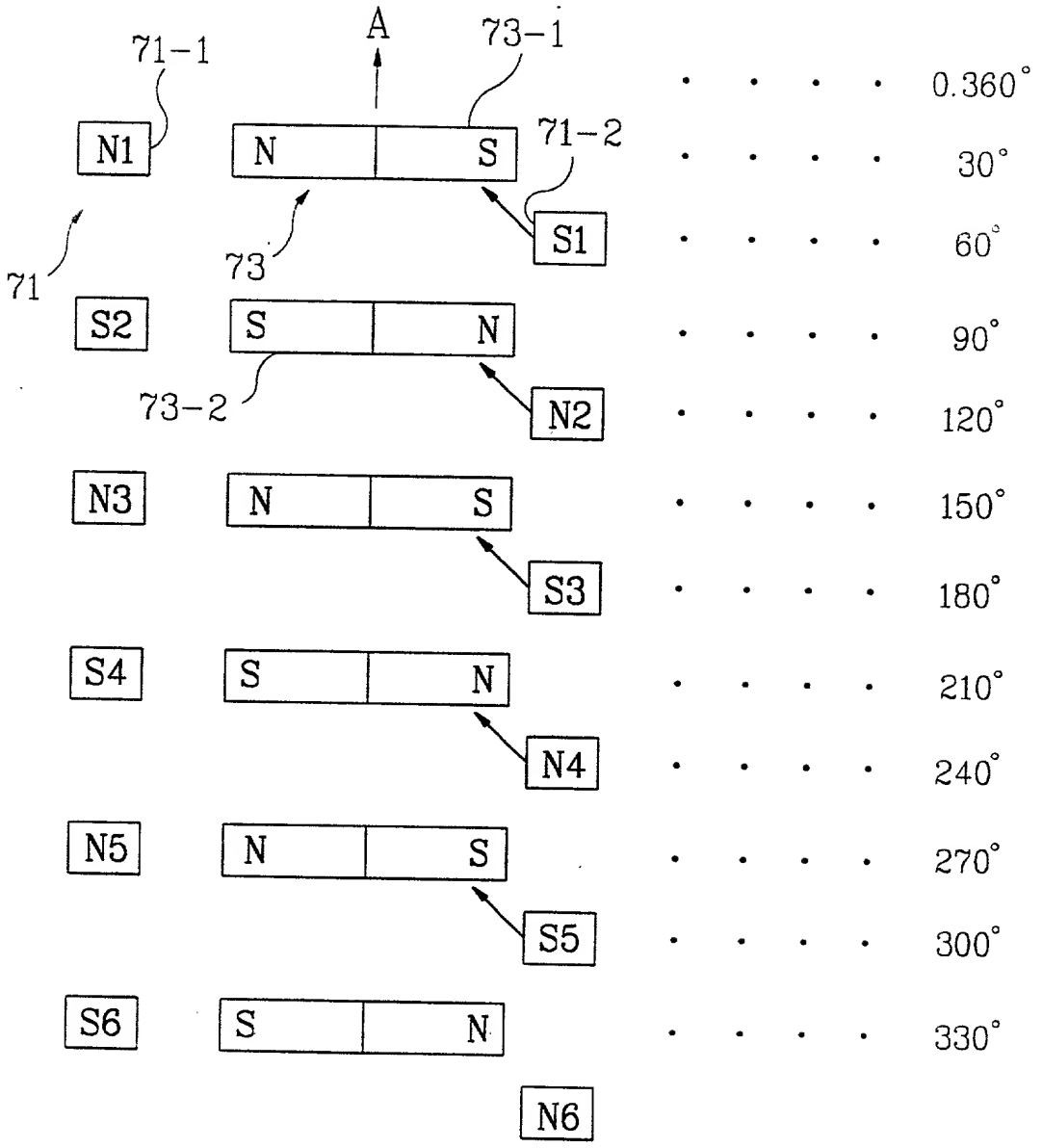


FIG. 7


A
71-1
73-1
71-2
N1
N
S
S1
71
73
S2
S
N
73-2
N2
N3
N
S
S3
S4
S
N
N4
N5
N
S
S5
S6
S
N
N6
0.360°
30°
60°
90°
120°
150°
180°
210°
240°
270°
300°
330°

DECLARATION AND POWER OF ATTORNEY

I hereby claim the benefit under Title 35, United States Code, §119(e) of any United States Provisional application(s) listed below:

PRIOR PROVISIONAL APPLICATIONS

(application serial number)	(Month / Day / Year filed)
(application serial number)	(Month / Day / Year filed)

I hereby claim the benefit under Title 35, United States Code, section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, section 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, section 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

Application Serial No.	**Filing Date**	**Status - patented, pending, abandoned**

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

I hereby appoint G. Gregory Schivley, Reg. No. 27,382, and each principal, attorney of counsel, associate and employee of Harness, Dickey & Pierce, P.L.C., who is a registered Patent Attorney, my attorney with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith. I request the Patent and Trademark Office to direct all correspondence and telephone calls relative to this application to Harness, Dickey & Pierce, P.L.C., P. O. Box 828, Bloomfield Hills, Michigan 48303 (248) 641-1600.

Full name of sole or first inventor: BAE, Youn Soo

Inventor's signature: BAE, Youn Soo

Date: 09 NOV. 2000

Residence: 170-57, Yuljun-dong, Jangan-gu, Suwon, Kyunggi-do 440-130

Citizenship: Rep. of Korea Republic of Korea KRX

Post Office Address: Same as above

Attorney Docket No. 2529-000047

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

MAGNETIC CIRCUIT FOR ROTATING APPARATUS

the specification of which (check one)

[X] is attached hereto.

[ ] was filed on _____ as Application Serial No. _____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information that is material to the patentability of the invention claimed in this application, or information that is material to the examination of this application, in accordance with Title 37, Code of Federal Regulations, section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, section 119(a)-(d) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

PRIOR FOREIGN APPLICATION(S)

			Priority Claim	
P98-17757	Rep. of Korea	16, May, 1998	x	
(Number)	(Country)	(Day/Month/Year filed)	Yes	No
PCT/KR99/00246	PCT	17 May, 1999	x	
(Number)	(Country)	(Day/Month/Year filed)	Yes	No
(Number)	(Country)	(Day/Month/Year filed)	Yes	No